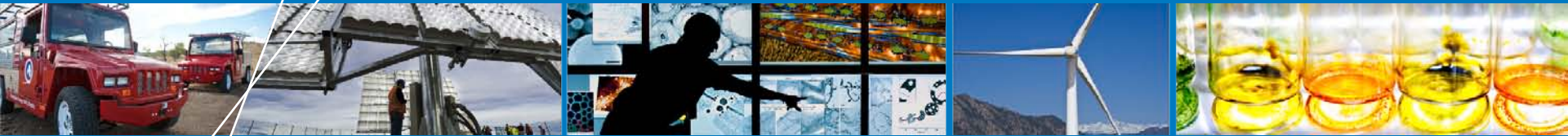


Energy Systems Integration Facility Workshop



Distribution Systems Integration

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Laboratories Discussed



- PSIL, SPL, ESL, OTA's, REDB, SCADA

Workshop Breakout Participants

- **Research labs and universities:**
 - National Energy Technology Lab (NETL)
 - University of Colorado
 - Colorado State University
- **Industry:**
 - Kohler
 - Encorp
 - Lockheed Martin
 - CenturyLink

Top Challenges

- **System integration of multiple energy sources**
- **Microgrid development and testing**
- **Increase collaborations and virtual connections with other research facilities**
- **Smart-grid standards (UL 1741, wrt ground faults on DC input, IEEE1547, etc.)**
- **New visualization techniques for optimal utilization of assets**
- **Protective components which have bidirectional capability**
- **Fast-responding fossil fuel generation**

Important ESIF Capabilities

- **Micro-grid demonstration projects that inform R&D**
- **Control strategies and advanced equipment that can respond to dynamic pricing scenarios**
- **Test and development of dispatch strategies and communication interfaces**
- **Development and test capabilities in SPL to allow for combination of protocols and testing of Home Area Networks**
- **Community energy storage development and testing**

Important ESIF Capabilities

- Interest in sequence of operations for storage and generation systems.
- Prototype testing – compliance, advanced functionality, performance, safety, etc. prior to field trial
- Capability to evaluate large backup generation systems at the outdoor test areas
- Development and testing of Combined Heat and Power

Important ESIF Capabilities

- **Capability to purposely disrupt your grid, doing different mode of data acquisition to see whether recovery and self-healing can occur.**
- **Testing in PSIL of fuel cells together with other technologies such as generation and storage**

Missing ESIF Capabilities / Suggestions

- Consider bringing in Legacy equipment and show how that equipment can work with new smart grid components
- Ability to evaluate effects of latency in communications for control stability between integrated components (may include additional requirements for cyber security communications)
- Investigate the 9 consumer behavior studies headed by Peter Cappers at Lawrence Berkeley to inform facility design (SPL)
- Consider adding class 1, class 2, and class 3 EV charging to allow for testing and research in ESIF
- Consider using ECL for developing safety systems for protective relays

Missing ESIF Capabilities / Suggestions

- **Need for automatic transfer switch setups for testing with industrial customers (UL standard 1008)**
- **Engine exhaust and gas analysis for IC processes**
- **Consider and characterize back pressure on exhaust ports for engine testing (some are sensitive)**
- **Pay close attention to measuring and performing offline harmonics analysis with a SCADA system**
- **Consider adding equipment to allow for fine tuning power quality analysis**
- **Consider safety within laboratories and make sure they have visual indicators regarding electrical and other hazards**